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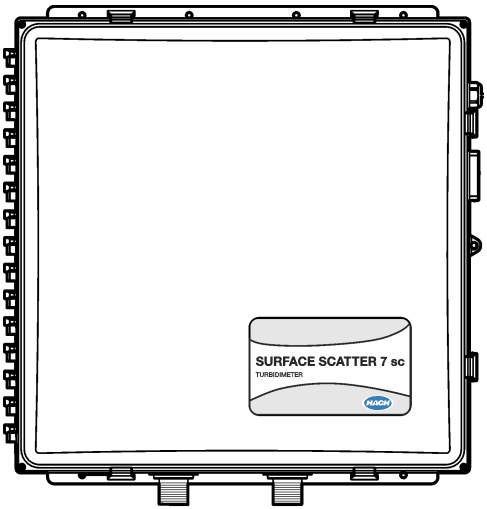
Surface Scatter 7 sc Turbidimeter

02/2025, Edition 5

User Manual



Section 1 Specifications

Specifications are subject to change without notice.
Refer to the controller documentation for the controller specifications.

Specification	Details
Dimensions (W x H x D)	642 x 637 x 187.8 mm (23.8 x 25.1 x 7.4 in)
Enclosure	NEMA 12, plastic
Weight	15.8 kg (34.8 lb)
Sensor cable	2 m (6.6 ft); Optional 7.62 m (25 ft) extension cable. Maximum cable length is 9.62 m (31.6 ft) Rating: 105 °C, 300 V, PVC jacket; wires: 22 AWG, PVC jacket
Mounting options	Wall
Pollution degree	2
Overvoltage category	I
Protection class	III
Power requirements	9 to 14 VDC supplied by an SC Controller
Environmental conditions	Indoor use
Operating temperature	Refer to the controller documentation.
Storage temperature	–20 to 80 °C (–4 to 140 °F); 95% relative humidity, non-condensing.
Altitude	2000 m (6562 ft) maximum
Sample source	Temperature: 0 to 50 °C (32 to 122 °F) Flow rate: 1.0 to 2.0 L/minute (0.3 to 0.5 gal/minute) (15 to 30 gal/hour)
Measuring range	0.01 to 9999.9 nephelometric turbidity units (NTU)
Accuracy	± 5% of reading or ± 0.1 NTU (the larger value) from 0 to 2000 NTU; ± 10% of reading from 2000 to 9999 NTU
Resolution (displayed)	<1000 NTU: 0.01 NTU 1000 to 9999.9 NTU: 0.1 NTU
Repeatability	± 1.0% of reading or ± 0.04 NTU
Response time	Initial response in 45 seconds
Calibration	Formazin stock solution
Verification	Standardization plates (100 or 1000 NTU). Standardization plate is measured immediately after calibration and used as a secondary turbidity standard.
Primary compliance methods	USEPA 180.1; Hach Method 8195; ASTM D 6698; Standard Methods 2130B
Certifications	CE Mark, EMC per IEC CISPR 11/ EN 55011, FCC, ISED
Warranty	2 years

Section 2 General information

In no event will the manufacturer be liable for damages resulting from any improper use of product or failure to comply with the instructions in the manual. The manufacturer reserves the right to make changes in this manual and the products it describes at any time, without notice or obligation. Revised editions are found on the manufacturer's website.

2.1 Safety information

The manufacturer is not responsible for any damages due to misapplication or misuse of this product including, without limitation, direct, incidental and consequential damages, and disclaims such damages to the full extent permitted under applicable law. The user is solely responsible to identify critical application risks and install appropriate mechanisms to protect processes during a possible equipment malfunction.

Please read this entire manual before unpacking, setting up or operating this equipment. Pay attention to all danger and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

If the equipment is used in a manner that is not specified by the manufacturer, the protection provided by the equipment may be impaired. Do not use or install this equipment in any manner other than that specified in this manual.

2.1.1 Use of hazard information

⚠ DANGER
Indicates a potentially or imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING
Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION
Indicates a potentially hazardous situation that may result in minor or moderate injury.

NOTICE
Indicates a situation which, if not avoided, may cause damage to the instrument. Information that requires special emphasis.

2.1.2 Precautionary labels

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed. A symbol on the instrument is referenced in the manual with a precautionary statement.

	Electrical equipment marked with this symbol may not be disposed of in European domestic or public disposal systems. Return old or end-of-life equipment to the manufacturer for disposal at no charge to the user.

2.1.3 EMC compliance

⚠ CAUTION
This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.

CE (EU)

The equipment meets the essential requirements of EMC Directive 2014/30/EU.

UKCA (UK)

The equipment meets the requirements of the Electromagnetic Compatibility Regulations 2016 (S.I. 2016/1091).

Canadian Radio Interference-Causing Equipment Regulation, ICES-003, Class A:

Supporting test records reside with the manufacturer.

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de classe A répond à toutes les exigences de la réglementation canadienne sur les équipements provoquant des interférences.

FCC Part 15, Class "A" Limits

Supporting test records reside with the manufacturer. The device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:

1. The equipment may not cause harmful interference.
2. The equipment must accept any interference received, including interference that may cause undesired operation.

Changes or modifications to this equipment not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at their expense. The following techniques can be used to reduce interference problems:

1. Disconnect the equipment from its power source to verify that it is or is not the source of the interference.
2. If the equipment is connected to the same outlet as the device experiencing interference, connect the equipment to a different outlet.
3. Move the equipment away from the device receiving the interference.
4. Reposition the receiving antenna for the device receiving the interference.
5. Try combinations of the above.

2.2 Icons used in illustrations

	
User supplied parts	Do not use tools

2.3 Product overview

⚠ DANGER	
	Chemical or biological hazards. If this instrument is used to monitor a treatment process and/or chemical feed system for which there are regulatory limits and monitoring requirements related to public health, public safety, food or beverage manufacture or processing, it is the responsibility of the user of this instrument to know and abide by any applicable regulation and to have sufficient and appropriate mechanisms in place for compliance with applicable regulations in the event of malfunction of the instrument.

⚠ WARNING	
	Fire hazard. This product is not designed for use with flammable liquids.

⚠ DANGER	
	Explosion hazard. The instrument is not approved for installation in hazardous locations.

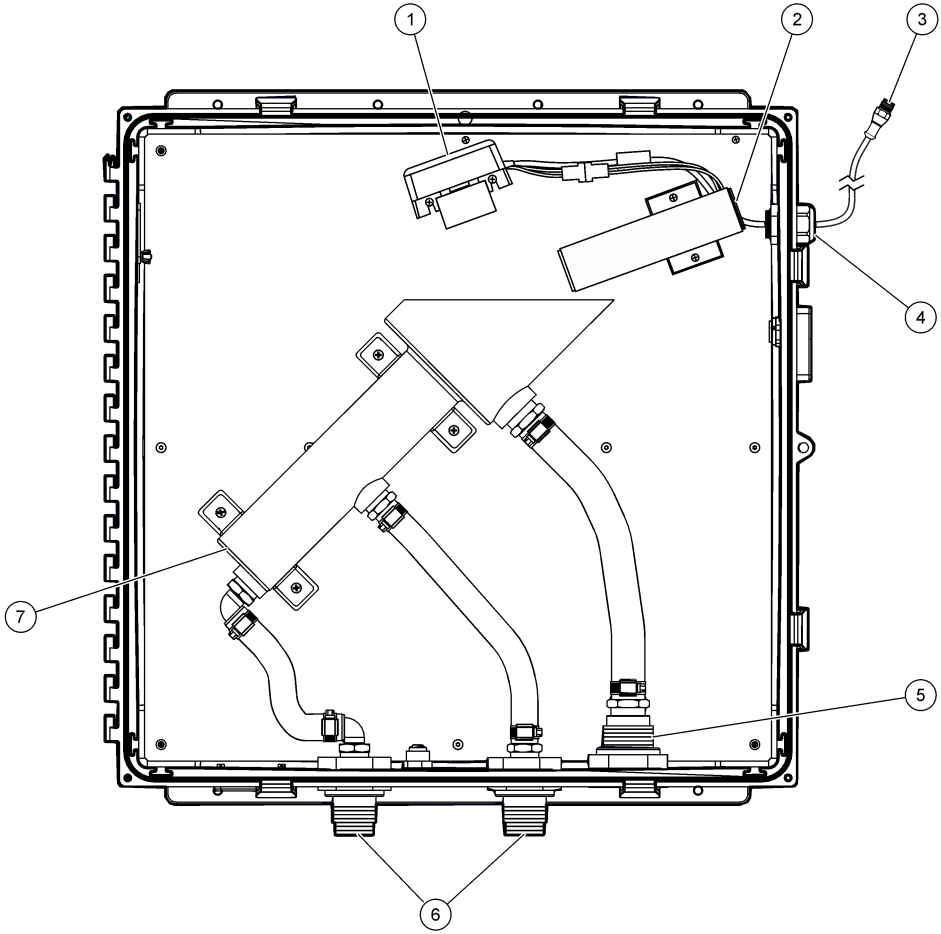
The Surface Scatter 7 sc (SS7 sc) turbidimeter continuously measures the turbidity in liquids. The instrument design is based on the nephelometric principle, where light scattered by particles suspended in the liquid is measured to determine the relative quantity of particulate matter in the liquid. Refer to Figure 1 and Figure 2.

The SS7 sc meets all U.S. Environmental Protection Agency (USEPA) design criteria and is capable of measuring turbidities from 0 to 9999 NTU. Calibration is based on Formazin, which is the primary turbidity standard used by the APHA Standard Methods for the Examination of Water and Wastewater and the USEPA.

Connect the SS7 sc to an SC Controller for power, operation, data collection, data transmission and diagnostics. Refer to the SC Controller manual for an overview of the controller.

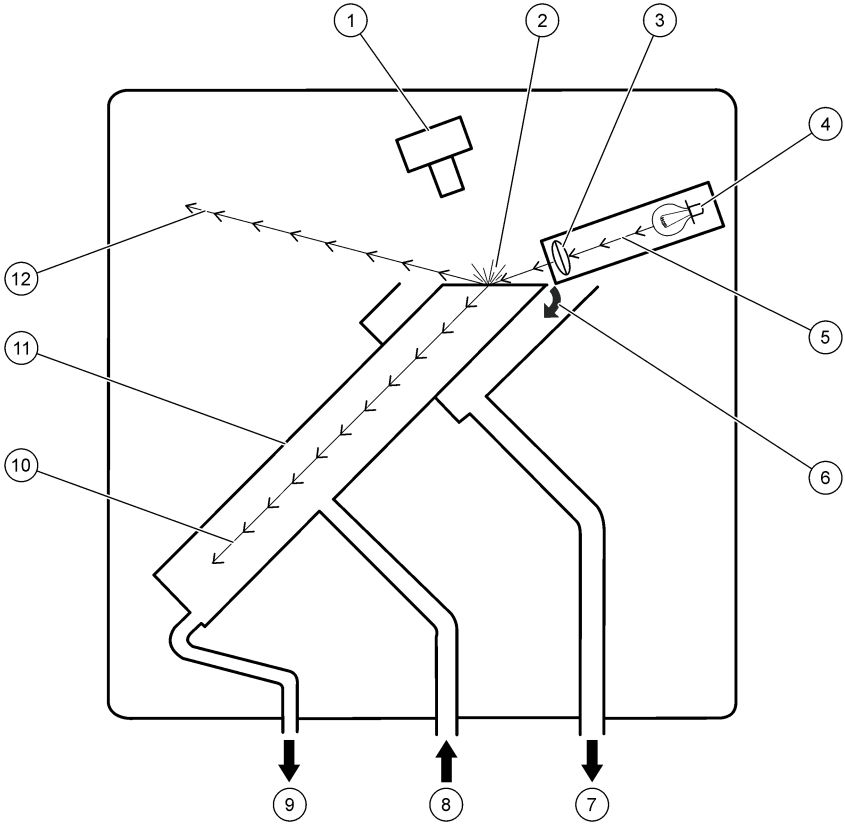
Special warning for controllers used with the SS7 sc—Controllers used with the SS7 sc must be certified for product safety utilizing a “Nationally Recognized Testing Laboratory” (NRTL). This is an independent testing laboratory certified by the “Occupational Health and Safety Administration” (OSHA). The NRTL safety certificate verifies products have been deemed safe for use in both the US and Canada market and that they comply with all relevant country safety standards. Note all Hach controllers are safety certified per the above requirements.

Figure 1 SS7 sc turbidimeter



1 Detector assembly	**5** Bulkhead fitting, 1-inch NPT
2 Light source assembly	**6** Bulkhead fitting, ¾-inch NPT
3 Instrument cable, 2 m (6.6 ft)	**7** Turbidimeter
4 Cable gland	

Figure 2 Optical diagram



1 Detector assembly	**5** Light beam	**9** Instrument drain (usually closed)
2 Scattered light	**6** Sample overflow	**10** Refracted light
3 Lens	**7** Sample overflow drain	**11** Turbidimeter
4 Lamp	**8** Sample in	**12** Reflected light

2.4 Theory of operation

The SS7 sc measures the light scattered by particles in the sample. The sample flows up through the turbidimeter. As the liquid spills over the top of the turbidimeter, a stable, flat surface of liquid forms and becomes the measuring surface. There is no contact between the liquid and the optical surfaces.

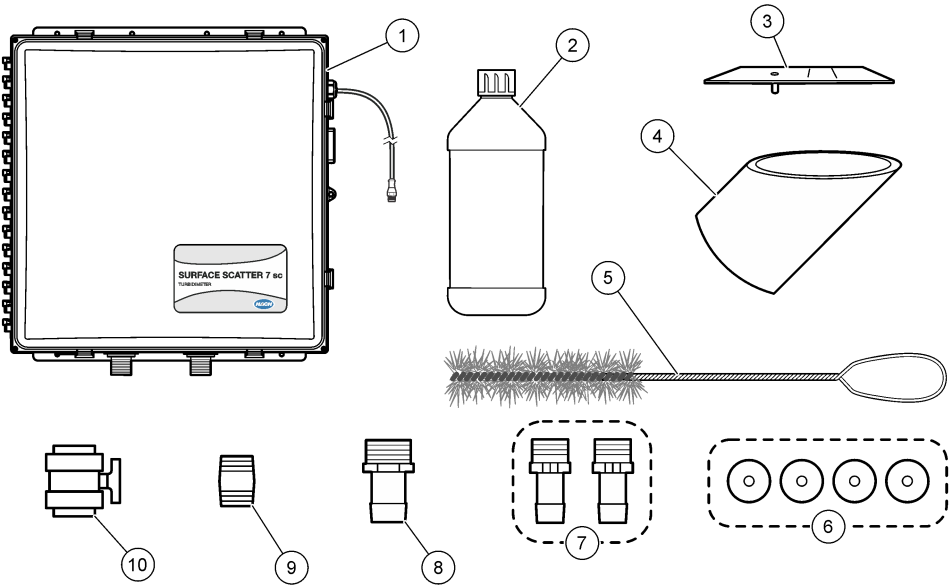
The lamp supplies a high-intensity beam of light that hits the surface of the liquid at an angle. Most of the light that hits the surface is reflected into the upper left-hand corner of the enclosure and is absorbed or refracted down into the turbidimeter tube. Refer to Figure 2 on page 8.

A small amount of the light that hits the surface is scattered by the particles. Light scattered at 90 degrees from the incident beam is seen by the detector assembly. The electronic signal generated by the detector assembly is directly related to the concentration of particles in the sample. The more light that is seen by the detector assembly, the higher the turbidity reading.

2.5 Product components

Make sure that all components have been received. Refer to Figure 3. If any items are missing or damaged, contact the manufacturer or a sales representative immediately.

Figure 3 Product components



1 Surface Scatter 7 sc turbidimeter	**6** Rubber washers, ¼-inch ID x 1-inch OD (4x)
2 Formazin stock solution, 4000 NTU, 500 mL	**7** Adapter, barb fitting, ¾-inch NPT to ¾-inch ID tubing (2x)
3 Light alignment template	**8** Adapter, barb fitting, 1-inch NPT to 1-inch ID tubing
4 Calibration cup	**9** Nipple, ¾-inch NPT
5 Cylinder brush, size 2	**10** Ball valve for instrument drain

Section 3 Installation

⚠ CAUTION

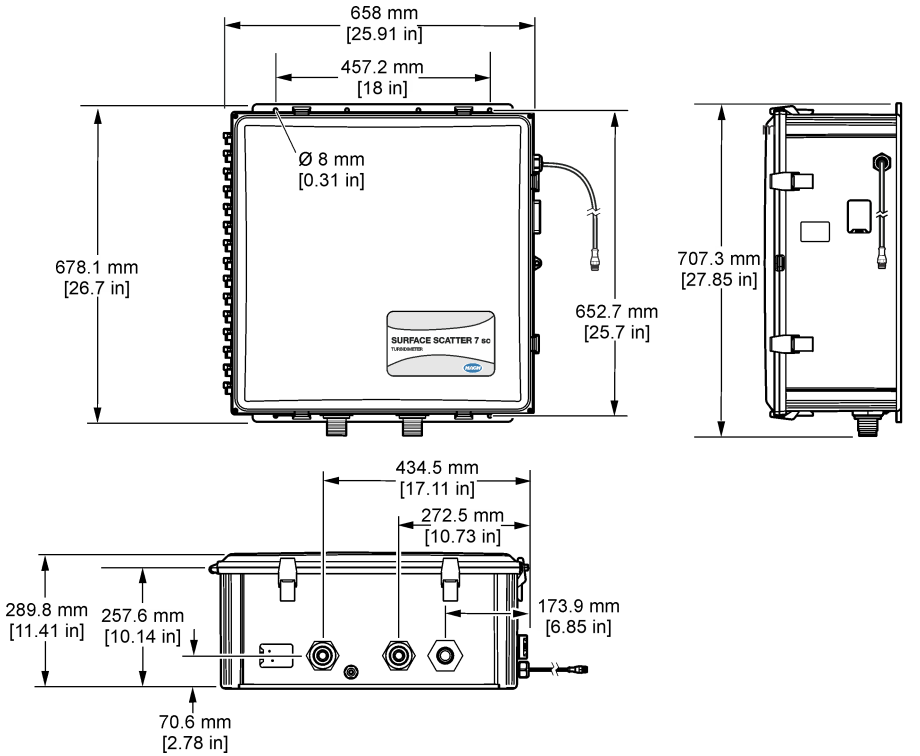
Multiple hazards. Only qualified personnel must conduct the tasks described in this section of the document.

3.1 Installation guidelines

- Install the instrument as near as possible to the sampling point to minimize the response time.
- Make sure that the sample is within the sample specifications in Specifications on page 3.
- Keep the operating temperature as constant as possible for best performance.
- Install the instrument level.
- Install the instrument near an open drain.
- Install the instrument indoors in an environment with minimum vibration.
- Do not install the instrument in direct sunlight or near a heat source.
- Make sure that there is sufficient clearance around the instrument to make plumbing connections.

- Keep away from dripping water.

3.2 Dimensions



3.3 Attach the instrument to a wall

1. Attach the instrument to a wall. The mounting hardware is supplied by the user. Refer to Figure 4.
2. Open the instrument door.
3. Make sure that the instrument does not tilt left-to-right or front-to-back. Refer to Figure 5.

Figure 4 Attach the instrument to a wall

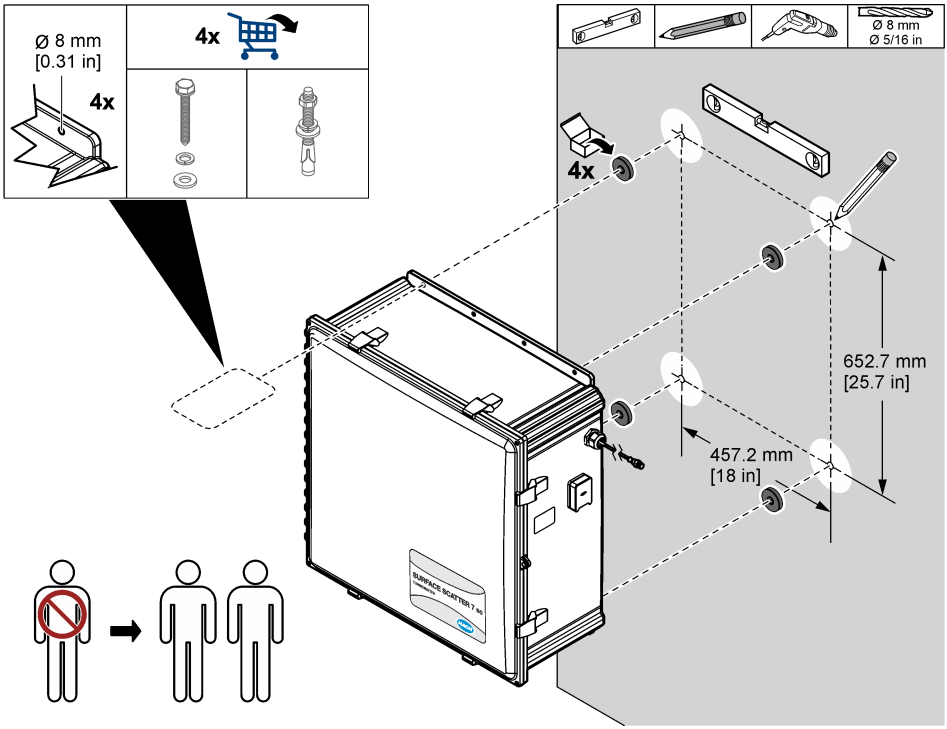
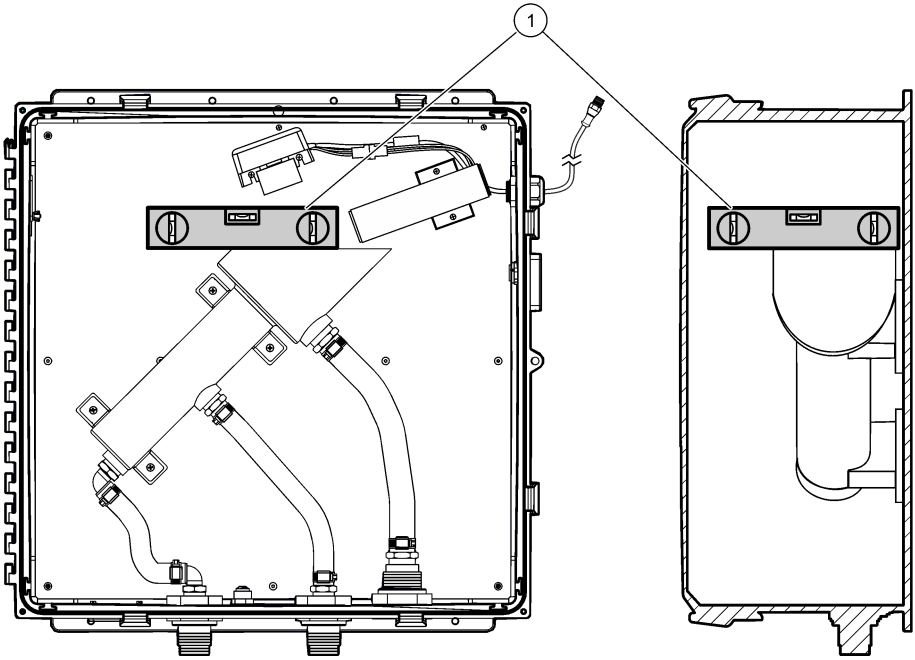


Figure 5 Use a leveling tool



1	Leveling tool

3.4 Plumbing

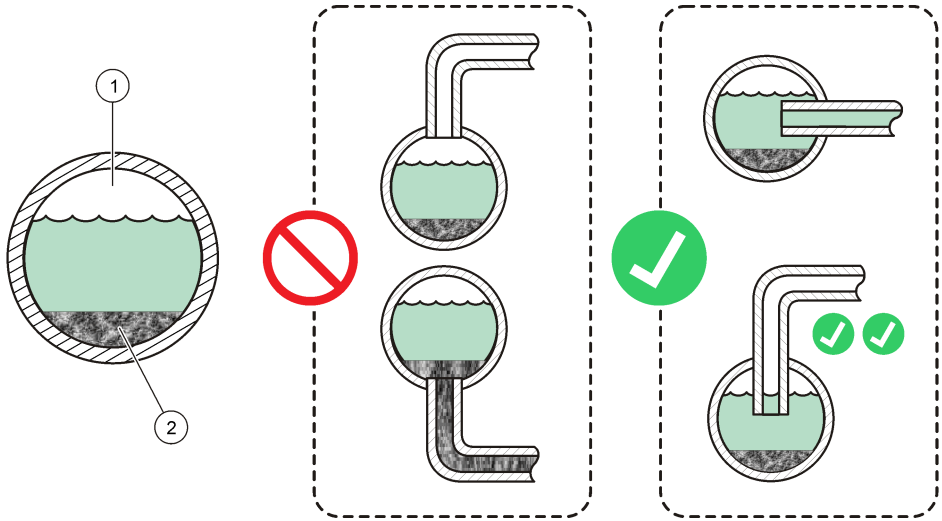
3.4.1 Sample line guidelines

Select a good, representative sample line point for the best instrument performance. The sample must be representative of the entire system.

Select a sample line diameter that keeps the lag time to a minimum, but also keeps the blockages caused by the solids in the sample to a minimum.

- Route the sample line as directly as possible.
- The use of long or large diameter sample lines will result in a longer lag time between the actual process conditions and instrument measurements.
- When larger diameter sample lines or long distances must be used, increase the flow to the instrument and bypass the excess flow to the drain or back to the process.
- Install sample line taps into the side or center of larger process pipes to prevent sediment from being pulled in from the bottom of the pipe. In addition, no air bubbles are pulled in from the top of the pipe. A sample line tap into the center of the pipe is the best option. Refer to Figure 6.

Figure 6 Sample line taps



1 Air (typical)	**2** Sediment (typical)

3.4.2 Install a bubble trap head regulator (optional)

If the sample cannot be supplied without bubbles, install the optional bubble trap head regulator. Refer to Figure 7 on page 14. Refer to Replacement parts and accessories on page 34 for ordering information.
Install the bubble trap head regulator a minimum of 127 mm (5 inches) above the instrument. Refer to the installation instructions supplied with the bubble trap head regulator to identify the necessary height based on the sample conditions and flow requirements.

The bubble trap head regulator will increase the response time to changes in the sample (1 to 2 minutes at 2 L/minute). For the fastest response time, use the highest flow rate applicable for the sample conditions. Higher flow rates decrease the effectiveness of the bubble trap.

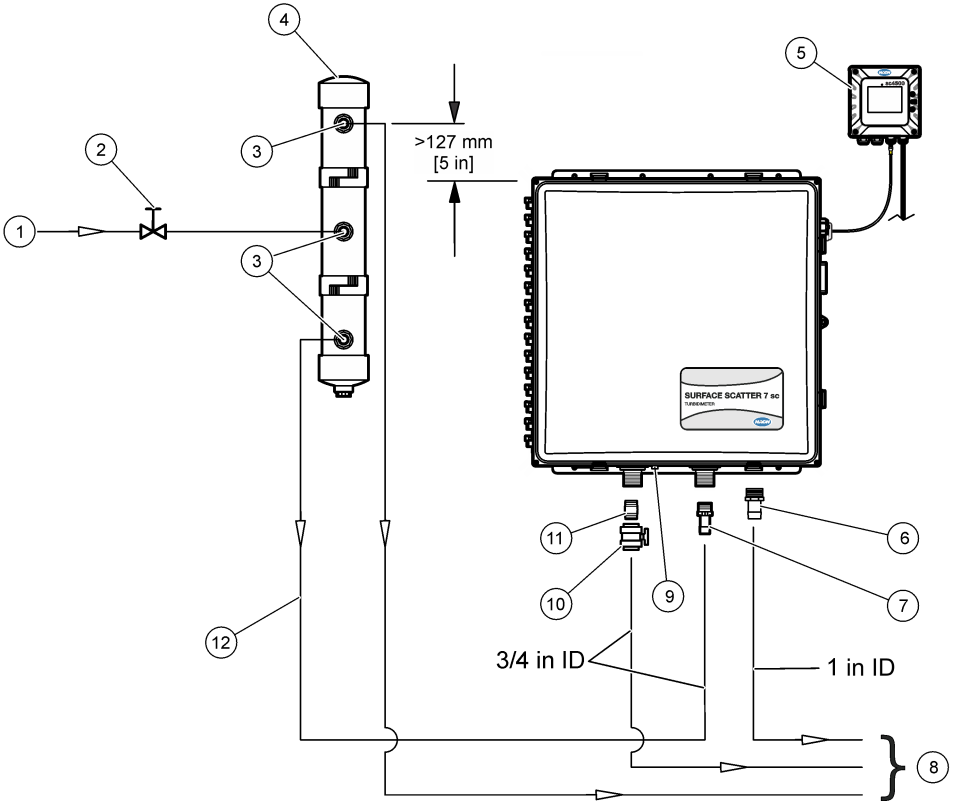
Note: *The bubble trap head regulator can also be used to decrease fluctuations in the flow rate caused by pulses from a pump and/or sample pressure.*

3.4.3 Connect the sample and drain lines

1. Connect the sample line to the instrument with ¾-inch ID tubing and the supplied ¾-inch adapter. Refer to Figure 7.

   It is recommended that a flow control valve is installed in the sample line.
2. Connect the instrument drain to an open drain with ¾-inch ID tubing and the supplied ¾-inch nipple, ball valve and washers.
3. Connect the sample overflow drain to an open drain with 1-inch ID tubing and the supplied 1-inch adapter and washer.

Figure 7 Plumbing diagram



1 Sample in	**7** Adapter, barb fitting, ¾-inch NPT to ¾-inch ID tubing
2 Flow control valve (customer supplied)	**8** To drain
3 Adapter, ¾-inch NPT x ¾-inch ID tubing (supplied with the bubble trap)	**9** Air purge fitting, ¼-inch (instrument air, 50 SCFH maximum)
4 Bubble trap/head regulator (optional)	**10** Ball valve
5 SC Controller[1]	**11** Nipple, ¾-inch NPT
6 Adapter, barb fitting, 1-inch NPT to 1-inch ID tubing	**12** Sample line, ¾-inch ID (customer supplied)

3.4.4 Connect an air purge (optional)

If the instrument is installed in a location with high humidity and/or fumes that cause corrosion, use ¼-inch OD tubing to connect dry, instrument air (50 SCFH maximum) to the air purge fitting. Refer to Figure 7 on page 14.

The air purge keeps positive pressure in the instrument with dry and clean air.

[1] SC4500 Controller shown. The SS7 sc is also compatible with an SC200 or SC1000 Controller.

3.5 Electrical installation

3.5.1 Connect the controller to power

Connect the controller to line power by hard-wiring in conduit or wiring to a power cord. Refer to the controller documentation for instructions.

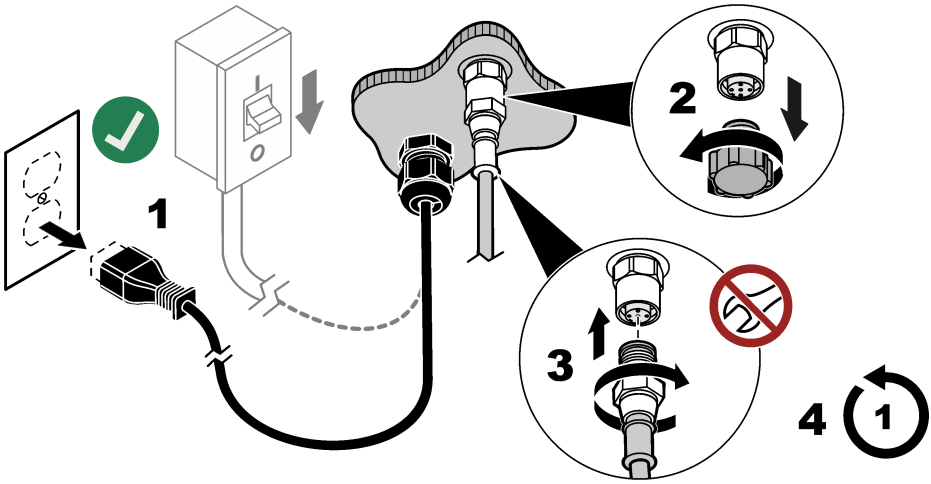
3.5.2 Connect the instrument to the controller

Connect the instrument cable to a digital input connector on the controller. Refer to Figure 8.

Keep the connector cap to seal the connector opening in case the cable must be removed.

Note: *A digital extension cable is available. Refer to* Replacement parts and accessories *on page 34*. *The maximum cable length is 9.6 m (31.2 ft).*

Figure 8 Connect the cable to the digital input connector



3.5.3 Connect external devices to the controller

Connect the controller relays, analog outputs, digital inputs or digital outputs to external devices as necessary. Refer to the controller documentation for instructions.

Section 4 Startup

1. Remove power to the controller.
2. Close the instrument door.
3. Close all of the door latches.
4. Supply power to the controller. The dark readings are measured. The dark readings set the zero point for the calibration curve.

   Note: *The dark readings are measured again 1 hour after power is supplied.*
5. Close the valve for the instrument drain.
6. Slowly open the flow control valve to start the flow of sample to the instrument.
7. Adjust the sample flow rate with the flow control valve. Refer to the sample specifications in Specifications on page 3.
8. Make sure there are no bubbles in the sample. Bubbles on the surface of the sample will cause incorrect readings.

9. Wait for the reading on the controller to become stable (1 to 2 hours can be necessary). Do not configure or calibrate the instrument before the readings are stable.
10. When the readings are stable, do the steps in Configure the instrument settings on page 16, then the steps in Calibrate with a Formazin stock solution on page 17.

Section 5 Configuration

5.1 Configure the instrument settings

Set the bubble rejection, signal average and the interval at which readings are saved to the data log. Set the measurement units, instrument name and measurement resolution shown on the display.

1. Go to the configuration menu:
   - SC4500 Controller—Select the tile of the device, then select **Device menu** > **Settings**.
   - SC200 and SC1000 Controllers—Go to the main menu, then select **SENSOR SETUP** > [select instrument] > **CONFIGURE**.
2. Select an option.

Option	Description
Bubble rejection status (or BUBBLE REJECT)	Sets the bubble reject to on (default) or off. When set to on, high turbidity readings caused by bubbles in the sample are not shown or saved to the data log.
Signal average (or SIGNAL AVG)	When enabled, the turbidity reading that shows on the controller display is an average of the values measured during the time interval selected. Options: Averaging disabled (or NO AVERAGING), 6, 30, 60 or 90 seconds (default: 30 seconds). ***Note:*** *The manufacturer recommends that Signal average (or SIGNAL AVG) is set to 30 seconds or less because of the fast response of the instrument.*
Unit (or MEAS UNITS)	Sets the measurement units that show on the controller display and that are saved to the data log. Options: mg/L, NTU (default), FTU and No units (or NO UNITS).
Name (or EDIT NAME)	Changes the name for the device at the top of the measurement screen. The name is limited to 12 characters in any combination of letters, numbers, spaces or punctuation.
Display resolution (or SET RESOLUTION)	Sets the number of decimal places that show on the controller display (0, 1 or 2). Options: XXXXX, XXXX.X or XXX.XX (default: XXXX.X)
Datalog interval (or DATALOG INTRVL)	Sets the frequency at which the turbidity reading is saved to the data log. Options: 5 seconds, 30 seconds, 1, 2, 5, 10, 15, 30 or 60 minutes or 4 hours (default: 15 minutes). When Datalog interval (or DATALOG INTRVL) is set to 15 minutes, the instrument can save approximately 6 months of readings.

5.2 System configuration

Refer to the controller documentation for system configuration, general controller settings and setup for outputs and communications.

Section 6 Calibration

Calibrate the instrument at 3-month intervals and when the light source is replaced or adjusted. Use one of the procedures that follow to calibrate the instrument:

- Calibrate with a lab instrument on page 17
- Calibrate with a Formazin stock solution on page 17

6.1 Calibrate with a lab instrument

The easiest way to calibrate the instrument is with a lab instrument. Measure the turbidity of the process sample with a lab instrument that has been calibrated. Then, enter the measured value. The measured value must 2 NTU or more to calibrate with a lab instrument.

1. Make sure that the laboratory turbidimeter is calibrated properly with primary turbidity standards according to manufacturer directions.
2. Make sure that the sample cells for the lab instrument are clean with no fingerprints and scratches.
3. Move the lab instrument near the SS7 sc.
4. Take a grab sample from the SS7 sc drain or sample line.
5. Immediately measure the turbidity with the laboratory instrument. Record the reading.
6. Go to the calibration menu:
   - SC4500 Controller—Select the tile of the device, then select **Device menu** > **Calibration**.
   - SC200 and SC1000 Controllers—Go to the main menu, then select **SENSOR SETUP** > [select instrument] > **CALIBRATE**.
7. Select **Perform calibration** (or **PERFORM CAL**).
8. Select the option for the output signal during calibration:

Option	Description
Active (or ACTIVE)	The instrument sends the current measured output value during the calibration procedure.
Hold (or HOLD)	The device output value is held at the current measured value during the calibration procedure.
Transfer (or TRANSFER)	A preset output value is sent during calibration. Refer to the controller user manual to change the preset value.

9. Enter the turbidity measurement from the lab instrument, then push **OK** (or **enter**).
10. Push **OK** (or **enter**).
11. Push **OK** (or **enter**) again to accept the reading.
12. Review the calibration result:
    - "The calibration was successfully completed." (or "GOOD CAL!")—The device is calibrated and ready to measure samples.
    - "The calibration failed." (or "BAD CAL!")—The calibration was not successful. Do a calibration again. Clean the instrument if necessary.
13. Push **OK** (or **enter**).
14. When the controller prompts "New baseline?" (or NEW BASELINE?), push **OK** (or **enter**) to set the verification baseline. Then, do the steps in Set the verification baseline on page 20.

    As an alternative, push **No** (or **back**), then do the steps that follow.
15. Push **OK** (or **enter**) to go to measurement mode.

    Note: *The instrument will complete a 2-minute cycle and then go to measurement mode. Measurements will show on the display, but the measurement value will flash, the output signal will not change and "Output mode warning" (or "OUT MODE WARN") shows until the 2-minute cycle is completed.*

6.2 Calibrate with a Formazin stock solution

Drain the instrument and use the supplied calibration cup and the Formazin stock solution to calibrate the instrument.

To dilute the supplied 4000-NTU Formazin stock solution, use filtered sample or demineralized water. Invert the bottle of Formazin stock solution repeatedly to mix before dilution. The manufacturer recommends that the standard used be no lower than 300 NTU.

Dilutions of the Formazin stock solution are not stable and should be used immediately, then discarded after use.

1. Drain the instrument as follows:
   a. Close the sample valve to stop the flow of sample to the instrument.
   b. Open the instrument drain valve.
   c. Close the instrument drain valve after the instrument is drained.
2. Install the calibration cup as follows: Open all of the door latches.
   a. Open all of the latches on the door.
   b. Open the instrument door.
   c. Put the calibration cup in the top of the turbidimeter. Refer to Figure 9.
3. Go to the calibration menu:
   - SC4500 Controller—Select the tile of the device, then select **Device menu** > **Calibration**.
   - SC200 and SC1000 Controllers—Go to the main menu, then select **SENSOR SETUP** > [select instrument] > **CALIBRATE**.
4. Select **Perform calibration** (or **PERFORM CAL**).
5. Select the option for the output signal during calibration:

Option	Description
Active (or ACTIVE)	The instrument sends the current measured output value during the calibration procedure.
Hold (or HOLD)	The device output value is held at the current measured value during the calibration procedure.
Transfer (or TRANSFER)	A preset output value is sent during calibration. Refer to the controller user manual to change the preset value.

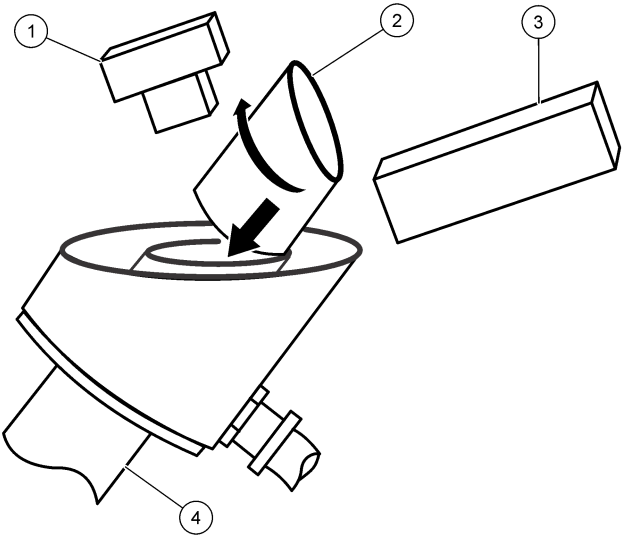
6. Enter the NTU value of the Formazin stock solution for the calibration, then push **OK** (or **enter**).
7. Add the Formazin stock solution to the calibration cup as follows:
   a. Slowly invert the supplied bottle of Formazin stock solution before use to mix. Slowly invert the Formazin stock solution to mix.
   b. Pour the Formazin stock solution into the calibration cup.
   c. Let the Formazin stock solution flow over the top of the calibration cup.
8. Wait until there are no bubbles on or near the surface of the Formazin stock solution.
9. Close the instrument door.
10. Close all of the door latches.
11. Push **OK** (or **enter**).
12. Push **OK** (or **enter**) again to accept the reading.
13. Review the calibration result:
    - "The calibration was successfully completed." (or "GOOD CAL!")—The device is calibrated and ready to measure samples.
    - "The calibration failed." (or "BAD CAL!")—The calibration was not successful. Do a calibration again. Clean the instrument if necessary. Prepare a new dilution of Formazin stock solution if necessary.
14. Push **OK** (or **enter**).
15. When the controller prompts "New baseline?" (or NEW BASELINE?), push **OK** (or **enter**) to set the verification baseline. Then, do the steps in Set the verification baseline on page 20.

    As an alternative, push **No** (or **back**), then do the steps that follow.
16. Open the instrument door.

17. Drain the instrument as follows:
    a. Open the instrument drain valve.
    b. Close the instrument drain valve after the instrument is drained.
18. Remove the calibration cup.
19. Close the instrument door.
20. Close all of the door latches.
21. Slowly open the sample valve.
22. Adjust the sample flow rate with the sample valve. Refer to the sample specifications in Specifications on page 3.
23. Push **OK** (or **enter**) to go to measurement mode.

    Note: *The instrument will complete a 2-minute cycle and then go to measurement mode. Measurements will show on the display, but the measurement value will flash, the output signal will not change and "Output mode warning" (or "OUT MODE WARN") shows until the 2-minute cycle is completed.*

Figure 9 Install the calibration cup



1 Detector assembly	**3** Light source assembly
2 Calibration cup	**4** Turbidimeter

6.3 Show the calibration history

The calibration history shows the information for the last calibration (e.g., calibration standard value, gain value, time, date and the operator initials).

1. Go to the calibration menu:
   - SC4500 Controller—Select the tile of the device, then select **Device menu** > **Calibration**.
   - SC200 and SC1000 Controllers—Go to the main menu, then select **SENSOR SETUP** > [select instrument] > **CALIBRATE**.
2. Select **Calibration history** (or **CAL HISTORY**).

6.4 Set the electrical zero point

Set the electrical zero point, which sets the zero value on the calibration curve.

The output signals are held when the electrical zero point is set.

1. Go to the calibration menu:
   - SC4500 Controller—Select the tile of the device, then select **Device menu** > **Calibration**.
   - SC200 and SC1000 Controllers—Go to the main menu, then select **SENSOR SETUP** > [select instrument] > **CALIBRATE**.
2. Select **Electronical zero point** (or **0 ELECTRONICS**).
3. Wait for the dark readings to be completed.

Section 7 Verification

Do a calibration verification at 1-month intervals with a standardization plate.

As an alternative, and for the best accuracy, calibrate the instrument at 1-month intervals.

7.1 Set the verification baseline

Measure a standardization plate to set the verification baseline. The measurement is saved to the controller. Later when a verification is done, the saved measurement is compared to a new measurement of the standardization plate to identify if the instrument is calibrated.

1. Do the steps in Calibrate with a Formazin stock solution on page 17. At the "New baseline?" (or NEW BASELINE?) prompt, push **OK** (or **enter**).
2. Enter the serial number of the standardization plate as follows:
   a. If the serial number shown on the display is the same as the serial number on the standardization plate, push **OK** (or **enter**).
   b. If not, enter the serial number on the plate, then push **OK** (or **enter**).

      If there is no serial number on the plate, record a serial number on the back of the plate (4-digits maximum).
3. Open the instrument door.
4. Drain the instrument as follows:
   a. Open the instrument drain valve.
   b. Close the instrument drain valve after the instrument is drained.
5. Remove the calibration cup.
6. Wipe the top of the sample cylinder. The sample cylinder is at the top of the turbidimeter.
7. Install the standardization plate as follows:
   a. Clean the standardization plate. Refer to Clean the standardization plate on page 22.
   b. Put the standardization plate over the sample cylinder. Make sure that the light beam hits the center of the plate.
   c. Record the orientation of the plate.

      Make sure to put the plate in the same orientation when it is measured during a verification.
8. Close the instrument door.
9. Close all of the door latches.
10. Push **OK** (or **enter**).
11. When the measurement is stable, push **OK** (or **enter**).
12. Open the instrument door.
13. Remove the standardization plate.
14. Close the instrument door.
15. Close all of the door latches.
16. Slowly open the sample valve.

17. Adjust the sample flow rate with the sample valve. Refer to the sample specifications in Specifications on page 3.
18. Push **OK** (or **enter**) to go to measurement mode.

    Note: *The instrument will complete a 2-minute cycle and then go to measurement mode. Measurements will show on the display, but the measurement value will flash, the output signal will not change and "Output mode warning" (or "OUT MODE WARN") shows until the 2-minute cycle is completed.*

7.2 Do a verification

1. Go to the verification menu:
   - SC4500 Controller—Select the tile of the device, then select **Device menu** > **Calibration** > **Verification** > **Complete a verification.**.
   - SC200 and SC1000 Controllers—Go to the main menu, then select **SENSOR SETUP** > [select instrument] > **CALIBRATE** > **VERIFICATION** > **PERFORM VER**.
2. Make sure that the serial number shown on the display is the same as the serial number on the back of the standardization plate.

   If the serial number is not the same, do the steps in Set the verification baseline on page 20.
3. Push **OK** (or **enter**).
4. Select the option for the output signal during verification:

Option	Description
Active (or ACTIVE)	The instrument sends the current measured output value during the verification procedure.
Hold (or HOLD)	The device output value is held at the current measured value during the verification procedure.
Transfer (or TRANSFER)	A preset output value is sent during verification. Refer to the controller user manual to change the preset value.

5. Drain the instrument as follows:
   a. Close the sample valve to stop the flow of sample to the instrument.
   b. Open the instrument drain valve.
   c. Close the instrument drain valve after the instrument is drained.
6. Open the instrument door.
7. Wipe the top of the sample cylinder.
8. Install the standardization plate as follows:
   a. Clean the standardization plate. Refer to Clean the standardization plate on page 22.
   b. Put the standardization plate over the sample cylinder. Make sure that the light beam hits the center of the plate.
   c. Make sure that the plate is in the same orientation that it was in when it is measured to set the verification baseline.
9. Close the instrument door.
10. Close all of the door latches.
11. Push **OK** (or **enter**).
12. When the measurement is stable, push **OK** (or **enter**).
13. Review the verification result:
    - "Verification was successful." (or "GOOD VER!")—The instrument is calibrated.
    - "Verification failed!" (or "BAD VER!") —The instrument is not calibrated. Clean the standardization plate and do a verification again. If the verification was not successful, do a calibration.
14. Open the instrument door.

15. Remove the standardization plate.
16. Close the instrument door.
17. Close all of the door latches.
18. Slowly open the sample valve.
19. Adjust the sample flow rate with the sample valve. Refer to the sample specifications in Specifications on page 3.
20. Push **OK** (or **enter**) to go to measurement mode.

    Note: *The instrument will complete a 2-minute cycle and then go to measurement mode. Measurements will show on the display, but the measurement value will flash, the output signal will not change and "Output mode warning" (or "OUT MODE WARN") shows until the 2-minute cycle is completed.*

7.3 Clean the standardization plate

Clean the standardization plate as follows:

- Use water and a dry, clean, no-lint cloth to remove fingerprints, dust and dirt.
- Do not use abrasive cleaners or cleaning solvents.

Keep the standardization plate in a clean, dry location to prevent damage to the plate. Replace the plate if it breaks or has scratches.

7.4 Set the pass/fail value

Set the pass/fail value for verifications. The default value is ±10%.
For example, if the reading during a verification is within ±10% of the verification baseline, the verification is successful.

1. Go to the verification menu:
   - SC4500 Controller—Select the tile of the device, then select **Device menu** > **Calibration** > **Verification**.
   - SC200 and SC1000 Controllers—Go to the main menu, then select **SENSOR SETUP** > [select instrument] > **CALIBRATE** > **VERIFICATION**.
2. Select **Pass/fail criteria** (or **P/F CRITERIA**).

7.5 Show the verification or baseline history

The verification history shows the information for the last verification (serial number of the standardization plate, set point, measurement, time, date and initials).

The baseline history shows the information for the last baseline set (serial number of the standardization plate, measurement, time, date and initials).

1. Go to the verification menu:
   - SC4500 Controller—Select the tile of the device, then select **Device menu** > **Calibration** > **Verification**.
   - SC200 and SC1000 Controllers—Go to the main menu, then select **SENSOR SETUP** > [select instrument] > **CALIBRATE** > **VERIFICATION**.
2. To show the verification history:
   - SC4500 Controller—Select **Verification history**.
   - SC200 and SC1000 Controllers—Select **VER HISTORY**.
3. To show the baseline history:
   - SC4500 Controller—Select **Baseline history**.
   - SC200 and SC1000 Controllers—Select **BASELINE HIST**.

Section 8 Maintenance

⚠ WARNING

Multiple hazards. Only qualified personnel must conduct the tasks described in this section of the document.

⚠ DANGER

Electrocution hazard. Remove power from the instrument before doing maintenance or service activities.

8.1 Clean the instrument

Remove sediment that has collected in the turbidimeter and/or on the overflow weir. Remove algae that has formed in the turbidimeter.

Samples that contain large quantities of settleable solids can cause solids to frequently collect in the turbidimeter. To keep the cleaning frequency at a minimum, operate the instrument with the instrument drain valve partially or fully open and increase the sample flow rate through the turbidimeter. If the instrument drain valve is kept partially open, replace the supplied ball valve with a flow control valve or a blockage in the instrument drain can occur.

1. Fully open the instrument drain valve and flush the turbidimeter with a high sample flow to remove the sediment. Then, close the instrument drain valve.
2. Remove algae with the supplied cylinder brush and a sterilizing solution (e.g., 1/3 cup of chlorine bleach added to 1 gallon of water).
3. If there is unwanted material in the enclosure of the instrument, remove the unwanted material with a warm water spray.

8.2 Replace the lamp

Replace the lamp when the "Lamp failed!" (or LAMP FAIL) error occurs.

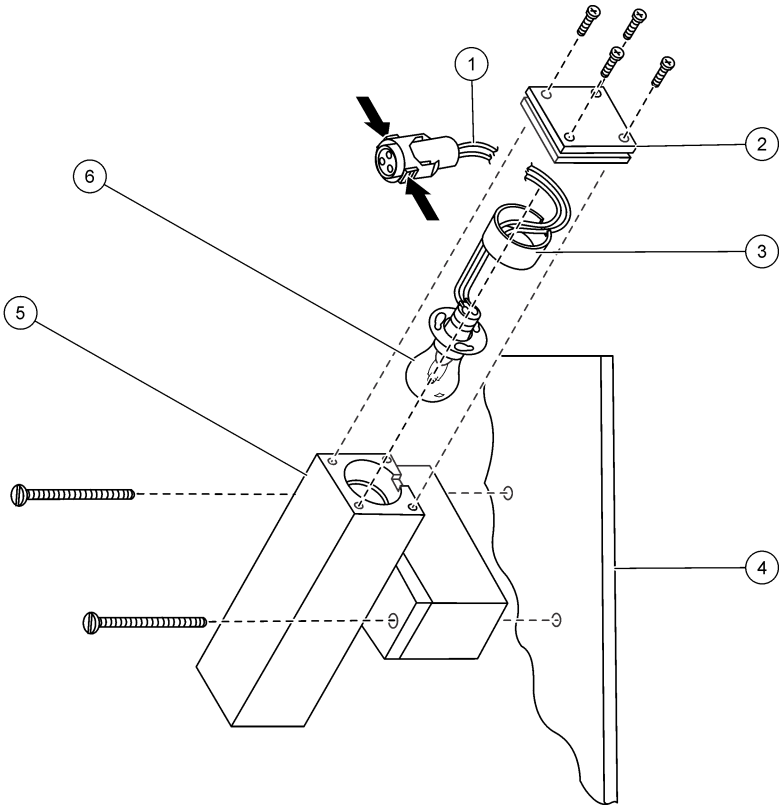
1. Remove power to the controller.
2. Open the instrument door.
3. Remove the light source assembly as follows:
   a. Disconnect the lamp cable. Refer to Figure 10.

      Push in at the middle of the connector to release the latches. Then, pull the two halves apart.
   b. Remove the two screws that hold the lamp source assembly to the back plate.
4. Remove the lamp as follows:
   a. Remove the four screws that hold the end plate on the light source assembly.
   b. Remove the end plate with the gasket, notched spacer and the lamp.
5. Put on gloves to keep fingerprints off of the new lamp. Fingerprints can cause damage to the lamp.
6. Wipe the new lamp with a soft, no-lint cloth.
7. Install the new lamp as follows:
   a. Put the lamp cable through the notched spacer. Make sure the side with the notch points away from the lamp.
   b. Put the lamp cable through the notches.
   c. Put the lamp and notched spacer in the light source assembly.
   d. Align the notch in the spacer with the notch in the light source assembly.
   e. Install the four screws that hold the end plate on the light source assembly.

8. Install the light source assembly as follows:
    a. Install the two screws that hold the lamp source assembly to the back plate.
    b. Connect the lamp cable. Put the two halves of the lamp cable connector together.
9. Make sure that the light source assembly is positioned correctly as follows:
    a. Close the instrument door.
    b. Supply power to the controller.
    c. When the controller shows a turbidity reading, open the door and install the calibration cup in the top of the turbidimeter. Refer to Figure 11.
    d. Put the light alignment template on top of the calibration cup with the guide pin down and against the flat notch on the inner side of the cup.

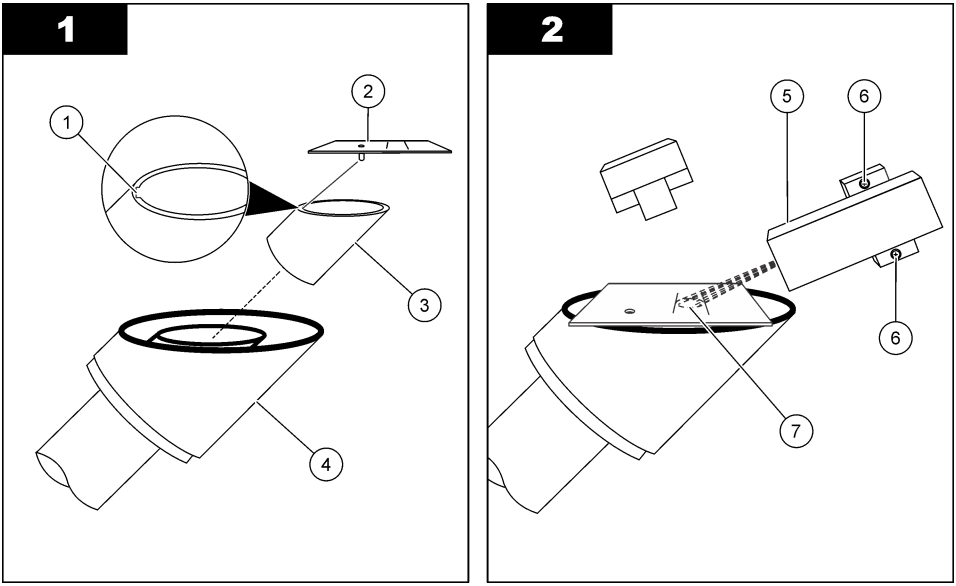
       Make sure that the back edge of the light alignment template is against the back plate.
    e. Examine the position of the lamp image on the surface of the light alignment template. Make sure that the lamp image is on the target area so that the center of the light beam is centered between the lines.
    f. To adjust the position of the light beam, loosen the two screws that secure the light source assembly to the backplate.
10. Calibrate the instrument. Refer to Calibration on page 16.

Figure 10 Lamp replacement



1 Lamp cable	**4** Back plate
2 End plate	**5** Light source assembly
3 Notched spacer	**6** Lamp

Figure 11 Lamp alignment



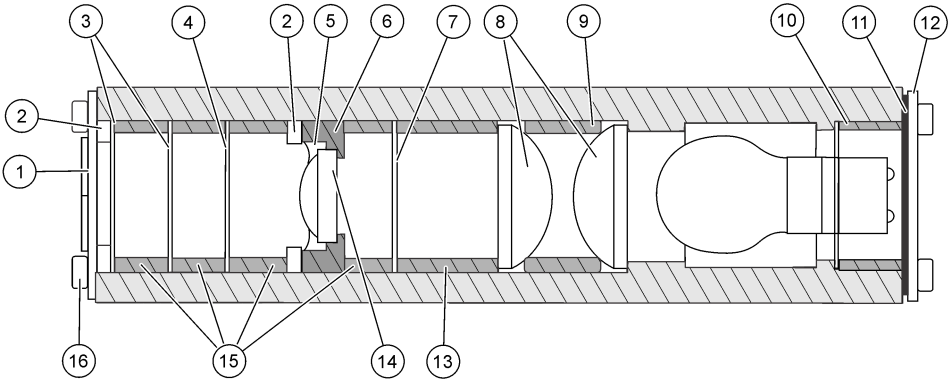
1 Flat notch	**5** Light source assembly
2 Light alignment template	**6** Screws that secure the light source assembly to the backplate
3 Calibration cup	**7** Target area
4 Turbidimeter	

8.3 Light source assembly maintenance

No maintenance of the light source assembly is usually necessary, except for the lamp replacement.

If the components of the light source assembly are removed, the components must be installed back in the correct position and orientation or the measurements will not be correct. Figure 12 shows the correct position and orientation of the components.

Figure 12 Light source assembly



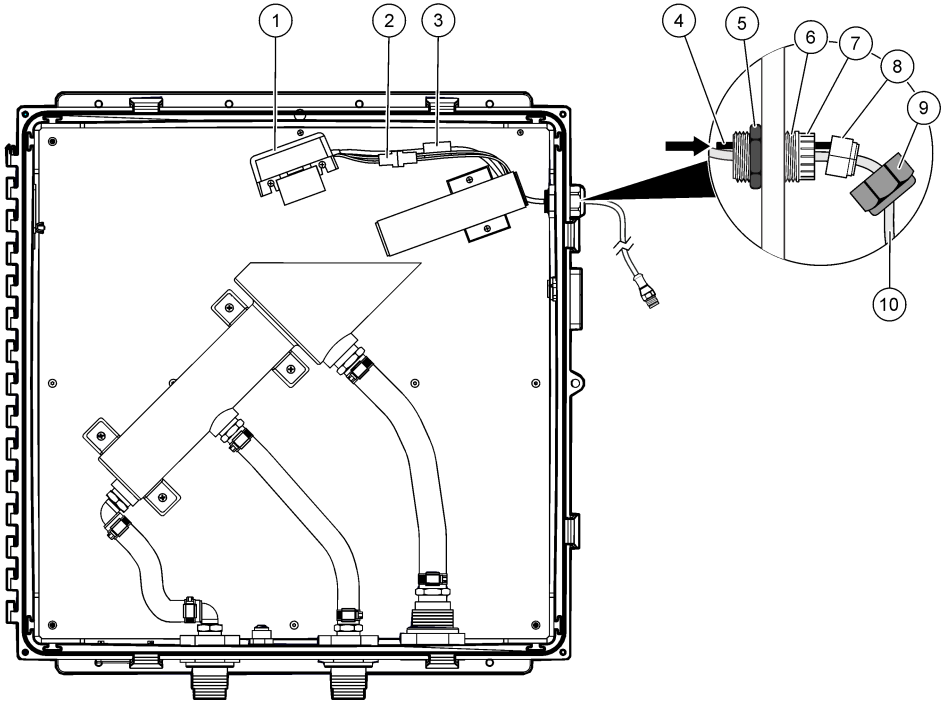
1 Shield assembly	**7** Small aperature	**13** Large spacer
2 Wavy washer (2x)	**8** Large lens (2x)	**14** Small lens
3 Medium aperature (2x)	**9** Medium spacer	**15** Small spacer (4x)
4 Large aperature	**10** Notched spacer	**16** Screws (8x)
5 Retaining ring	**11** Gasket	
6 Lens holder	**12** End plate	

8.4 Replace the detector assembly

Replace the detector assembly as identified in Errors on page 30 and Warnings on page 30.

1. Record the controller settings for the analog outputs or relays used with the instrument, if applicable.
2. Remove power from the controller.
3. Disconnect the instrument cable from the controller.
4. Open the instrument door.
5. Remove the instrument cable from the cable gland assembly as follows:
   a. Remove the grey nut from the cable gland. Refer to Figure 13.
   b. Turn the cable gland to remove it from the black nut that is in the enclosure.
   c. Remove the cable gland from the enclosure.
   d. Push the split grommet out off the cable gland. Use a blunt object that is ¼-inch in diameter or less (e.g., blunt end of a pen).
   e. Remove the grey nut and split grommet from the instrument cable.
   f. Pull the instrument cable through the cable gland and black nut, then into the enclosure.
6. Open the cable clamp that is in the enclosure. Remove the instrument cable from the cable clamp.
7. Disconnect the lamp cable. Refer to Figure 13.
   Push in at the middle of the connector to release the latches. Then, pull the two halves apart.
8. Remove the two screws that hold the detector assembly to the wall of the enclosure.
9. Install the new detector assembly with the two screws.
10. Connect the lamp cable. Put the two halves of the lamp cable connector together.
11. Put the instrument cable into the cable clamp.
12. Put the instrument cable back through the cable gland assembly as follows:
    a. Put the instrument cable through the black nut and then the cable gland.
    b. Install the black nut on the cable gland.
    c. Put the split grommet on the instrument cable. Refer to Figure 13 for the correct orientation.
    d. Rotate the split grommet counter-clockwise and push it into the cable gland.
    e. Put the instrument cable through the grey nut.
    f. Turn the grey nut to install it on the cable gland.
13. Close the instrument door.
14. Connect the instrument cable to the controller.
15. Tighten the grey nut of the cable gland.
16. Supply power to the controller.
    The controller will prompt that the SS7 cannot be found and show the serial number of the removed detector assembly.
17. Select the serial number of the removed detector assembly.
18. Enter the serial number of the new detector assembly.
19. Configure the controller settings for the analog outputs and relays used with the instrument, if applicable.
20. Do a calibration. Refer to Calibration on page 16.

Figure 13 Replace the detector assembly



1 Detector assembly	**5** Black nut	**9** Grey nut
2 Lamp cable connector	**6** Cable gland	**10** Instrument cable
3 Cable clamp	**7** Clamping fingers	
4 Blunt object	**8** Split grommet	

Section 9 Troubleshooting

Problem	Possible cause	Solution
Low readings	The detector or lens is dirty. The light path has a blockage. A light source failure has occurred.	Contact technical support if the detector assembly is dirty or has a coating. Clean the lens of the detector assembly with isopropyl alcohol and a cotton swab. Remove the blockage in the light path. Refer to "Lamp failed! (or LAMP FAIL)" in Errors on page 30.
High readings	The detector is dirty. Calibration standard was low. Flow rate is too high, which causes bubbles.	Clean the detector assembly. Examine the value and expiration date on the calibration standard. Make sure that the flow rate is within the sample specifications. Do a calibration.

Problem	Possible cause	Solution
Erratic readings	There are bubbles in the sample.	Examine the value and expiration date on the calibration standard. Calibrate the instrument. Increase the Signal average (or SIGNAL AVG) setting. Make sure that the Bubble rejection status (or BUBBLE REJECT) setting is set to on. Decrease the sample flow rate.
Continuous overrange	The calibration standard was not correctly prepared or was not stable when the calibration was done.	Identify the accuracy of the calibration standards. Calibrate the instrument.
Continuous underrange		

9.1 Errors

When an error occurs, measurements stop, the measurement screen flashes and all outputs are held as specified in the controller menu. To show the errors:

- SC4500 Controller—Select the red measurement screen or the small red arrow, or go to the main menu and select **Notifications** > **Errors**.
- SC200 and SC1000 Controllers—Go to the main menu, then select **DIAGNOSTICS** > [select instrument] > **ERROR LIST**.

A list of possible errors is shown in Table 1.

Table 1 Error messages

Error	Description	Solution
ADC failed! (or ADC FAIL)	An ADC failure has occurred.	Remove power to the controller. Wait approximately 10 seconds, then supply power to the controller. If the error continues, replace the detector assembly. Refer to Replace the detector assembly on page 28.
Lamp failed! (or LAMP FAIL)	A light source failure has occurred.	Make sure that the cable for the light source assembly is connected. Replace the lamp if a lamp failure occurred. Refer to Replace the lamp on page 23. If the problem continues, a failure of the circuit board may have occurred. Replace the light source assembly.
Flash failed! (or FLASH FAIL)	A communication error occurred between the controller and the instrument.	Examine the instrument cable connection at the controller. Make sure that the instrument cable is no longer than 9.6 m (31.2 ft). Remove power to the controller. Wait approximately 10 seconds, then supply power to the controller. If the problem continues, replace the detector assembly. Refer to Replace the detector assembly on page 28.

9.2 Warnings

When a warning occurs, a warning icon flashes and a message is shown on the bottom of the controller display. A warning does not affect the operation of the relays and outputs. To show the warnings:

- SC4500 Controller—Select the yellow measurement screen or the small yellow arrow, or go to the main menu and select **Notifications** > **Warnings**.
- SC200 and SC1000 Controllers—Go to the main menu, then select **DIAGNOSTICS** > [select instrument] > **WARNING LIST**.

A list of possible warnings is shown in Table 2.

Table 2 Warning messages

Warning	Description	Solution
Dark warning (or DARK WARNING)	The dark reading measured too much light.	Close the instrument door and all of the door latches before power is supplied to the controller or when "Electronical zero point (or 0 ELECTRONICS)" is selected. If the warning continues, replace the detector assembly. Refer to Replace the detector assembly on page 28.
Temperature warning (or TEMP WARNING)	The internal temperature of the sensor head is too high.	Contact technical support.
Data log is full. (or DATA LOG FULL)	The data log is full. No additional data will be saved to the data log until the data log is downloaded.	Download the data log.
Event log is full. (or EVENTLOG FULL)		
5 volt warning (or 5 VOLT WARN)	The + 5V signal is not within the range of 4.5 to 5.5 V.	Contact technical support.
V In warning (or VIN WARNING)	The input voltage from the controller is not 9.08 to 14.3 V. Examine the instrument cable.	Make sure that only one SS7 sc is connected to controller or the second instrument only draws 4 W maximum.
Lamp voltage warning (or LAMP VOLT WARN)	The lamp voltage is not 3.96 to 4.48 V.	Replace the lamp.
Lamp current warning (or LAMP CURR WARN)	The lamp current is not 1.67 to 2.75 A.	Replace the lamp.
Output mode warning (or OUT MODE WARN)	The instrument is not in measurement mode. For example, the instrument is in calibration or verification mode.	No action is necessary.
Appcode update failed (or AC UPDATE FAIL)	The application code update failed.	Contact technical support.
External flash failed (or EXT FLASH FAIL)	A failure of the external copy of the application code has occurred.	No action is necessary. The problem is temporary.
Internal flash failed (or INT FLASH FAIL)	A failure of the internal copy of the application code has occurred.	No action is necessary. The problem is temporary.
English only (or ENGLISH ONLY)	The device driver file only includes English.	Update the device driver with the latest version.
V-ref warning (or VREF WARN)	The ADC voltage reference is out of specification.	Contact technical support.

9.3 Events

Events are saved to the event log and are not shown on the controller. Refer to the controller documentation for instructions on how to download the event log. Table 3 shows the events that are logged.

Table 3 Event list

Event	Event #	Data1	Data2	Data3
Bubble reject event (or BUBBLEREJ EVENT)	0	0 = Off 1= On	—	—
Signal average (or SIGNAL AVG)	1	0 = 1 1 = 6 2 = 30 3 = 60 4 = 90	—	—
Data log interval changed (or LOG INTV EVENT)	2	0 = 5 seconds 1 = 30 seconds 2 = 1 minute 3 = 2 minutes 4 = 5 minutes 6 = 15 minutes 7 = 30 minutes 8 = 1 hour 9 = 4 hours	—	—
Power on (or POWER ON EVENT)	3	—	—	—
Calibration event (or CAL EVENT)	4	Standard	Gain	Operator
Verification event (or VERIFY EVENT)	5	Expected value	Measured value	Operator
Dark warning event (or DARK EVENT)	6	A/D counts	—	—
Temperature event (or TEMP EVENT)	7	Present	Minimum	Maximum
Voltage warning event (or VOLT EVENT)	8	Vin	5 V	Vref
Lamp warning event (or LAMP WARN EVENT)	9	Lamp V	Lamp I	—
Analog to digital converter failed! (or A2D FAIL EVENT)	10	—	—	—
Lamp failed! (or LAMP FAIL EVENT)	11	Lamp V	Lamp I	—
Output mode event (or OUT MODE EVENT)	12	0 = Normal (NORMAL) 1 = Active (ACTIVE) 2 = Hold (HOLD) 3 = Transfer (TRANSFER)	—	—
Baseline (or BASELINE)	13	Serial number	Expected	Operator

Table 3 Event list (continued)

Event	Event #	Data1	Data2	Data3
Appcode update start (or AC UPDATE STRT)	14	—	—	—
Appcode update done (or AC UPDATE DONE)	15	—	—	—
Appcode update failed (or AC UPDATE FAIL)	16	—	—	—
Appcode internal failed (or AC INTERN FAIL)	17	—	—	—
Appcode external failed (or AC EXTERN FAIL)	18	—	—	—
Flash erase (or FLASH ERASE)	19	—	—	—
Device driver updated (or DD UPDATE)	20	—	—	—
Service mode (or SERVICE MODE)	21	0 = Off 1 = On	—	—

9.4 Instrument information

1. Go to the diagnostics/test menu:
   - SC4500 Controller—Select the tile of the device, then select **Device menu** > **Diagnostics/Test**.
   - SC200 and SC1000 Controllers—Go to the main menu, then select **SENSOR SETUP** > [select instrument] > **DIAG/TEST**.
2. Select an option.

Option	Description
Instrument status (or INST STATUS)	Shows the version of the installed software, device driver, device driver content and hardware.
Serial number (or SERIAL NUMBER)	Shows the serial number of the instrument.
Internal temperature (or INT TEMP)	Shows the internal temperature of the instrument (°C). Shows the minimum and maximum internal temperatures of the instrument.
Reset setup (or DEFAULT SETUP)	Sets the instrument settings back to the default settings. The calibration is not changed.
Power check (or POWER CHECK)	Shows the lamp voltage (volts) and lamp current (amps). Shows the + 5V signal value, voltage input supplied by the controller and the reference voltage.
Service mode (or SERVICE MODE)	Sets the instrument to normal or service mode. Sets the status of the output signals while the instrument is in service mode. Measurements are not saved to the data log while the instrument is in service mode.
Service diagnostics (or SERVICE DIAGS)	For Service use only

Section 10 Replacement parts and accessories

⚠ WARNING

Personal injury hazard. Use of non-approved parts may cause personal injury, damage to the instrument or equipment malfunction. The replacement parts in this section are approved by the manufacturer.

Note: *Product and Article numbers may vary for some selling regions. Contact the appropriate distributor or refer to the company website for contact information.*

Replacement parts

Description	Item no.
Installation kit:	—
Formazin stock solution, 4000 NTU, 500 mL	246149
Cylinder brush, size 2	68700
Calibration cup	4502100
Light alignment template	4507600
Rubber washer, ¼-inch ID x 1-inch OD	4417300
Adapter, barb fitting, ¾-inch NPT to ¾-inch ID tubing	4043900
Adapter, barb fitting, 1-inch NPT to 1-inch ID tubing	4037200
Nipple, ¾-inch NPT, polyethylene	3155100
Ball valve for instrument drain, 3/4-inch NPT	4507300
Detector assembly	101279
Lamp assembly	101278
Light source assembly	4500400
Shield assembly	4529900
Tubing replacement kit	4669100
Bulkhead fitting, 3/4-inch NPT	4501100
Bulkhead fitting, 1-inch NPT	4501200
Elbow fitting, 3/4-inch ID x 3/4-inch NPT	4049600
Hose clamp, 0.985-inch x 1.135 inch	4501500
Hose clamp, 1.22-inch x 1.41 inch	4501600

Accessories

Description	Item no.
Bubble trap head regulator	4668000
Digital extension cable, 7.7 m (25 ft)	5796000
Standardization plate kit, includes: 0–100 NTU range plate and 0–1000 NTU range plate	2351300
StablCal, 400 NTU, 500 mL	7121649

Section 11 Modbus registers

Use the Modbus registers in the control system to configure and get data from the instrument. Refer to Table 4.
R = Read only

R/W = Read and write

Table 4 Modbus registers

Tag Name	Register	Data type	Length	R/W	Description
Turbidity (or TURB)	40001	Float	2	R	Measured turbidity value
Turbidity integer (or TURB INT)	40003	Integer	1	R	Integer turbidity value
Turbidity integer value X 100 (or TURB INT X 100)	40004	Integer	1	R	Integer turbidity value x 100
Name (or EDIT NAME)	40005	String	6	R/W	Sensor name or location
Bubble rejection status (or BUBBLE REJECT)	40011[2]	Integer	1	R/W	0 = off 1 = on
Signal average (or SIGNAL AVG)	40012[2]	Integer	1	R/W	0 = 1 second 1 = 6 seconds 2 = 30 seconds 3 = 60 seconds 4 = 90 seconds
Data log interval (or DATALOG INTRVL)	40013[2]	Integer	1	R/W	0 = 5 seconds 1 = 30 seconds 2 = 1 minute 3 = 2 minutes 4 = 5 minutes 6 =10 minutes 7 = 15 minutes 8 = 30 minutes 9 = 60 minutes 10 = 4 hours
Resolution (or SET RESOLUTION)	40014	Integer	1	R/W	Maximum number of decimal places for the measured turbidity value 0 = XXXXX 1 = XXXX.X 2 = XXX.XX
Pass/fail criteria (or P/F CRITERIA)	40015[2]	Integer	1	R/W	Pass/fail criteria for verifications (1 to 10%)
Unit (or MEAS UNITS)	40016	Integer	1	R/W	0 = mg/L 7 = NTU 42 = FTU
Service mode (or SERVICE MODE)	40018[2]	Integer	1	R/W	0 = disabled 1 = enabled

[2] To write to this tag, write 46478 to register 49938.

Table 4 Modbus registers (continued)

Tag Name	Register	Data type	Length	R/W	Description
Serial number (or SERIAL NUMBER)	40021	String	6	R	Serial number of the instrument
Software version (or SW VERS)	40027	Float	2	R	Software version installed
DD firmware (or DD FIRMWARE)	40029	Integer	1	R	Firmware version of the device driver
DD content (or DD CONTENT)	40030	Integer	1	R	Content version of the device driver
HW version (or HW VERSION)	40031	Integer	1	R	Hardware version of the PC board
Temperature (or TEMP)	40032	Float	2	R	Instrument temperature in °C
Dark counts (or DARK)	40034	Integer	2	R	A/D counts for the dark turbidity value
Raw turbidity (or RAW TURB)	40036	Float	2	R	Turbidity value with the dark offset and gain applied
Turbidity counts (or TURB COUNTS)	40038	Integer	2	R	A/D counts for turbidity
Maximum temperature (or TEMP MAX)	40040	Float	2	R	Maximum temperature in °C
Minimum temperature (or TEMP MIN)	40042	Float	2	R	Minimum temperature in °C
Lamp voltage (or LAMP V)	40044	Float	2	R	Lamp voltage (volts)
Lamp current (or LAMP I)	40046	Float	2	R	Lamp current (amps)
+ 5V (or +5 V)	40048	Float	2	R	+ 5 V measurement
Voltage input (or INPUT V)	40050	Float	2	R	Input voltage (~12 V)
Reference voltage (or VREF)	40052	Float	2	R	Reference voltage measurement (2.5 V)
Calibration factor (or GAIN)	40067	Float	2	R	Calibration gain factor used to convert A/D counts to turbidity.
Initials (or INITIALS)	40083	String	2	R	Operator initials used for the last calibration.
Last calibration (or LAST CAL DATE)	40085	Time2	2	R	Time of the last calibration
Calibration value (or CAL VALUE)	40087	Float	2	R	Turbidity value of the Formazin standard used for the last calibration

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